

9.3 Direct Variation

1) $y = 0.407x^{1.5}$
 $y = 0.407(93)^{1.5}$
 $y = 365$ days

3) $y = ax$

a) $y = 0.5x$

b) $y = (0.5)(3) = 1.5$

c) $20 = 0.5x$
 $x = 40$

5) $y = ax^{5/2}$

a) $y = 1.7x^{5/2}$

b) $y = 1.7 (4)^{5/2} = 1.7 (4^{1/2})^5 = 1.7 2^5 = 1.7 32 = 54.4$

c) $413.10 = 1.7x^{5/2}$

$$x^{5/2} = \frac{413.10}{1.7}$$

$$x^{5/2} = 243$$

$$x = (243)^{2/5}$$

$$x = (243^{1/5})^2$$

$$x = 3^2$$

$$x = 9$$

7) $\left(\frac{3}{2}\right) = a (36)^{1/2}$

$$\frac{3}{2} = 6a$$

$$a = \left(\frac{1}{6}\right) \frac{3}{2}$$

$$a = \frac{1}{4}$$

9) A 2, B 3, C 1

(A) looks like the basic square root function $y = \sqrt{x}$ where $0 < b < 1$.

(B) looks like part of the basic quadratic function $y = x^2$ where $b > 1$.

(C) looks like part of the basic linear function $y = x$ where $b = 1$.

11)

a) Yes

b) Yes—output values are nearly identical in both tables.

c) $y = (0.8)(64)^{1/3} = (0.8)(4) = 3.2$

d) If $y = 1.8$, then $x = 11.4$

13) $y = ax$ General function

$$\frac{29.4 \text{ kg} \cdot \text{m}}{\text{sec}^2} = m \quad (3 \text{ kg})$$

$$a = \frac{29.4 \text{ kg} \cdot \text{m}}{(3 \text{ kg}) \cdot \text{sec}^2}$$

$$a = 9.8 \frac{\text{m}}{\text{sec}^2} \quad \text{Variation constant}$$

$$y = 9.8x \quad \text{Specific function}$$

15) $y = ax^2$ General function

$$(3.125 \text{ in}) = a \cdot (5 \text{ in})^2$$

$$3.125 \text{ in} = a \cdot 25 \text{ in}^2$$

$$a = \frac{3.125 \text{ in}}{25 \text{ in}^2} \quad \text{Variation constant}$$

$$a = \frac{0.125}{\text{in}}$$

$$a = 0.125x^2 \quad \text{Specific function}$$

Skill and Review

17)

a) $\sqrt{6x-5} = x$
 $6x-5 = x^2$
 $x^2 - 6x + 5 = 0$
 $x^2 - x - 5x + 5 = 0$
 $(x^2 - x) + (-5x + 5) = 0$
 $x(x-1) + (-5)(x-1) = 0$
 $(x-5)(x-1) = 0$
 $(x-5) = 0$ or $(x-1) = 0$
 $x = 5$ or $x = 1$

b) $\sqrt{(6)(5)-5} = 5$ $\sqrt{(6)(1)-5} = 1$
 $= \sqrt{30-5} = 5$ $\sqrt{6-5} = 1$
 $= \sqrt{25} = 5$ $\sqrt{1} = 1$
 $5 = 5$ True $1 = 1$ True

19)

a) $x^4 + 9 = 0$
 $x^4 = -9$

No solution; there are no real even roots for negative numbers. See Fact 9.3 (n is even and $a < 0$).

b) $x^2 - 6x = -8$
 $x^2 - 6x + 9 = -8 + 9$ Complete the square: $2n = -6, n = -3, n^2 = 9$
 $(x - 3)^2 = 1$
 $\sqrt{(x - 3)^2} = \pm \sqrt{1}$ Undo square by taking square root of both sides
 $x - 3 = \pm 1$
 $x = \pm 1 + 3$
 $x = 4$ or $x = 2$